Exhibit F

The Claim	Samsung Phones and Tablets[1]
Claim 31	
31[a]. A process for the simultaneous storage and play back of multimedia data, comprising the steps of:	A Samsung device can simultaneously store and play back multimedia data. *See, e.g.,* In one aspect, the Device can store video while simultaneously playing back a previously stored video file. In another aspect, the Device can store a video file transferred from a PC, while at the same time playing back that same file while it is being stored to the storage device In another aspect the Device can store a video file while at the same time playing back that same file
[31b] providing a physical data source, wherein said physical data source accepts broadcast data from an input device, parses video and audio data from said broadcast data, and temporarily	A Samsung device has an input device that may include a USB port, a mobile communication device, and/or, on information and belief, other components such a Qualcomm Snapdragon or Samsung Exynos System on Chip, or other similar chip that may perform parsing and or storage, including chips made by other third parties. *See, e.g.,*

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[1] In this chart, reference is made to certain identified Samsung Mobile Devices. The same analysis applies to other Samsung Mobile Devices with the same functionality, including but not limited to Samsung Galaxy Note (Note, Note II, Note 3, Note 4, Note Edge, Note 8.0, Note 10.1, Note Pro 12.2), Samsung Galaxy Mega (Mega, Mega 2), Samsung Galaxy S (S, SII, SIII, S4, S5, S6, S6 Edge, Round, Victory), Samsung Galaxy Tab (Tab, Tab 2, Tab 3, Tab 3 Lite, Tab 4, Tab A, Tab Pro, Tab S), and other such devices (and versions thereof) having the same functionality. Additionally, this chart also references the specific processor included in certain of these devices. The same analysis applies to mobile devices that include other processors with the same functionality, for example the processors in each of the accused mobile devices.

The Claim	Samsung Phones and Tablets[1]
	substantially the same way, for example by receiving data that has been transmitted to the device, PID filtering, startcode detecting and otherwise analyzing that data, and writing that data to memory locations and disks, to yield the same result, a properly formatted data stream for further processing by the rest of the system.
[31c] providing a source object, wherein said source object extracts video and audio data from said physical data source;	A Samsung device provides a source object, a collection of data and operations that, among other things, extracts video and audio data from the physical data source. Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claims collection of data and operations. For example, in a Samsung device, video and audio data move from the Snapdragon chip, Exynos chip, or similar chip, to memory, including DRAM and/or the other subprocessors. The Snapdragon chips contain a "multimedia subsystem."

The Claim	Samsung Phones and Tablets[1]
	Figure 1: MSM8960 Block Diagram Snapdragon S4 Whitepaper, at page 2. The Samsung Exynos Chips contain a multimedia subsystem (also called a DMC), which extracts video and audio data from the physical data source

The Claim	Samsung Phones and Tablets[1]

	1.2.3 Multimedia
	
	The features of multimedia are:
	
	- Camera Interface
	   – Multiple input support
	       ○ ITU-R BT 601/656 mode
	       ○ DMA (AXI 64-bit interface) mode
	       ○ MIPI (CSI) mode
	       ○ Direct FIFO mode (from LCDC)
	   – Multiple output support
	       ○ DMA (AXI 64-bit interface) mode
	       ○ Direct FIFO mode (to LCDC)
	   – Digital Zoom In (DZI) capability
	   – Multiple camera input support
	   – Programmable polarity of video sync signals
	   – Input horizontal size support up to 4224 pixels for scaled and 8192 pixels for un-scaled resolution
	   – Image mirror and rotation (X-axis mirror, Y-axis mirror, 90°, 180°, and 270° rotation)
	   – Various image formats generation
	   – Capture frame control support
	   – Image effect support
	- JPEG Codec supports:
	   – Compression/Decompression up to 65536 × 65536
	   – Supported format of compression
	       ○ Input raw image: YCbCr4:2:2 or RGB 565
	       ○ Output JPEG file: Baseline JPEG of YCbCr4:2:2 or YCbCr4:2:0
	   – General-purpose color-space converter
	- 2D Graphic Engine supports:
	   – BitBLT
	   – Maximum 8000 × 8000 image size
	   – Window clipping, 90°/180°/270°/Rotation, X Flip/Y Flip
	   – Totally 4-operand raster operation (ROP4)
	   – Alpha blending (user-specified constant alpha value/per-pixel alpha value)
	   – 8/16/24/32-bpp. Packed 24-bpp color format, Premultiplied/Non-premultiplied alpha format
	   – 1 bpp/4 bpp/8 bpp/16 bpp/32 bpp Mask format, YCbCr format

- Digital TV Interface supports:
  - High-Definition Multimedia Interface (HDMI) 1.4 a
  - Up to 1080 p 60 Hz and 8-channel/112 kHz/24-bit audio
  - 480 p, 576 p, 720 p, 1080i (cannot support 480i)
  - HDCP V1.1
  - 3D support
- Rotator
  - Supported image format: YCbCr422 (Interleave), YCbCr420 (Non-interleave), and RGB565 and RGB8 (unpacked)
  - Supported rotate degree: 90, 180, 270, flip vertical, and flip horizontal
- Video processor: The video processor supports:
  - BOB/2D-IPC mode
  - Production of YCbCr 4: 4: 4 output to help the mixer blend video and graphics
  - 1/4X to 16X vertical scaling with 4-tap/16-phase polyphase filter
  - 1/4X to 16X horizontal scaling with 8-tap/16-phase polyphase filter
  - Pan and scan, Letterbox, and NTSC/PAL conversion using scaling
  - Flexible scaled video positioning within display area
  - 1/16 pixel resolution Pan and Scan modes
  - Flexible post video processing
    - Color saturation, brightness/contrast enhancement, edge enhancement
    - Color space conversion between BT.601 and BT.709
  - Video input source size up to 1920 × 1080
- Video Mixer
  The Video Mixer supports:
  - Overlapping and blending input video and graphic layers
  - 480p, 576p, 720p, and 1080i/p display size
  - Four layers (1 video layer, 2 graphic layer, and 1 background layer)
- TFT-LCD Interface
  The TFT-LCD Interface supports:
  - 24/18/16-bpp parallel RGB Interface LCD
  - 8/6 bpp serial RGB Interface
  - Dual i80 Interface LCD
  - 1/2/4/8 bpp Palletized or 8/16/24-bpp Non-Palletized Color TFT
  - Typical actual screen size: 1080 × 1024,1024 × 768, 800 × 480, 640 × 480, 320 × 240, 160 × 160, and so on
  - Virtual image up to 16M pixel (4K pixel × 4K pixel)
  - Five Window Layers for PIP or OSD
  - Real-time overlay plane multiplexing
  - Programmable OSD window positioning
  - 16-level alpha blending

Samsung Exynos User Guide at 1-7 -- 1-8

To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung Mobile Devices perform substantially the same function as the Source Object, for example that of extracting video and audio data from said physical data source, in substantially the same way, for example by using one or more instantiations of software codes and/or

The Claim	Samsung Phones and Tablets[1]
	hardware/firmware combinations, to yield the same result, data and operations executing in the Device that operate on the video and audio data from the physical data source.
[31d] providing a transform object, wherein said transform object stores and retrieves data streams onto a storage device;	A Samsung device provides a transform object, a collection of data and operations that, among other things, transforms the form of data upon which it operates. For example, Samsung devices transform the form of the data. Upon information and belief, the Samsung devices store multimedia program data during recording, and play back certain portions, such as certain frames, during certain trickplay operations. Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations. As another example, Samsung devices also perform a temporal transform. For example, Samsung devices allow users to store programs to watch at a later time, and simultaneously with the program being stored on the device. A Samsung Mobile Device has a storage device. For example, a Samsung Mobile Device includes a solid state memory, e.g. flash memory used for storage. And the Samsung devices contain a collection of data and operations that store the multimedia data on the storage device. Additionally, a Samsung device includes many memory locations, including solid state disks, ram, cache memory, and other locations. On information and belief, many of the devices has at least 16 GB of internal storage, which takes the form of flash memory. On information and belief, Samsung Mobile Devices store MPEG transport stream packets on a solid state disk (SSD) during recording. These data could come from MPEG files transferred to the device from a PC, or from a wireless communications network, among others. To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Transform Object, for example that of storing and retrieving data streams onto a storage device, in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, data and operations executing in the device that move video and audio data to and from storage locations.
[31e] wherein said source objects obtains a	A Samsung device provides a source object, a collection of data and operations that, among other things, obtains a buffer from the transform object, converts video data into data streams, and fills the buffer with the streams. Samsung device software obtains a buffer, converts video data into data streams and fills the buffer with the streams. Samsung devices contain DMA

The Claim	Samsung Phones and Tablets[1]
buffer from said transform object, said source object converts video data into data streams and fills said buffer with said streams;	controllers and other hardware and software that effectively utilizes buffers and memory to perform the claimed operations. On information and belief the media switch in the chips will write to various memory locations using direct memory access (DMA) transfers, and this action is controlled by a DMA controller. See also ## 1 Product Overview ### 1.1 Introduction Exynos 4412 is a 32-bit RISC cost-effective, low power, performance optimized and Coretex-A9 Quad Core based micro-processor solution for smart phone applications. The memory system has dedicated DRAM ports and Static Memory port. The dedicated DRAM ports support LPDDR2 interface for high bandwidth. Static Memory Port supports NOR Flash and ROM type external memory and components. To reduce the total system cost and enhance the overall functionality, Exynos 4412 includes many hardware peripherals, such as TFT 24-bit true color LCD controller, Camera Interface, MIPI DSI, CSI-2, System Manager for power management, MIPI slimbus interface, MIPI HSI, four UARTs, 24-channel DMA, Timers, General I/O Ports, three I2S, S/PDIF, eight IIC-BUS interface, three HS-SPI, USB Host 2.0, USB 2.0 Device operating at high speed (480 Mbps), two USB HSIC, four SD Host and high-speed Multimedia Card Interface, Chip to Chip interface, and four PLLs for clock generation. Samsung Exynos User Guide at 1-1

8 Direct Memory Access Controller (DMAC)

This chapter includes:

- Overview of DMA Controller
- Register description
- Instruction

8.1 Overview

The two Direct Memory Access (DMA) tops that Exynos 4412 supports:

- Memory-to-Memory (M2M) transfer (DMA_mem)
- Peripheral-to-memory transfer and vice-versa (DMA_peri)

The DMA_mem consists of one PL330 (DMA) and some logics. DMA_peri consists of two PL330s (DMA0 and DMA1) and dma_map.
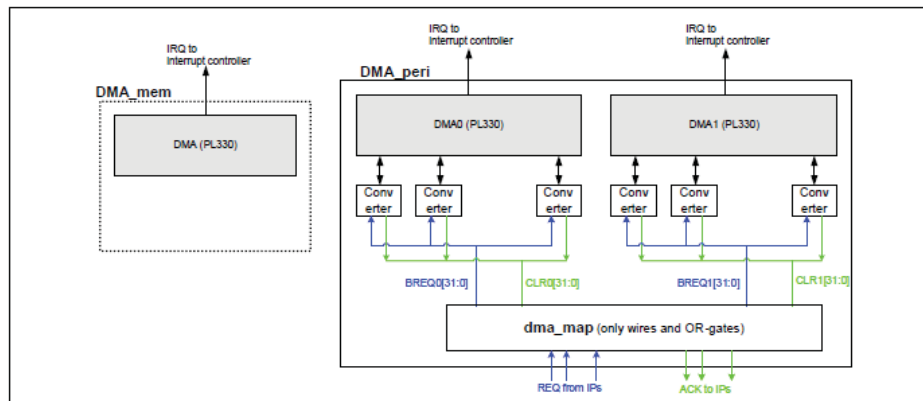
Figure 8-1 illustrates the two DMA tops.

Figure 8-1   Two DMA Tops

The attributes that the DMA_mem DMA Controllers have:

Samsung Exynos User Guide at 8-1

The Claim	Samsung Phones and Tablets[1]
	Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Source Object, for example that of obtaining a memory location, converting the data stream, and filling the memory location in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, data and operations executing in the device that operate on the video and audio data in conjunction with memory locations and other software processes.
[31f] wherein said source object is automatically flow controlled by said transform object;	A Samsung device has a source object that, among other things, is automatically flow controlled by a transform object. On information and belief, the Samsung device software has self-regulating data flow in relation to, for example, the single-port DRAM. See also

The Claim	Samsung Phones and Tablets[1]
	# 1 Product Overview ## 1.1 Introduction Exynos 4412 is a 32-bit RISC cost-effective, low power, performance optimized and Coretex-A9 Quad Core based micro-processor solution for smart phone applications. The memory system has dedicated DRAM ports and Static Memory port. The dedicated DRAM ports support LPDDR2 interface for high bandwidth. Static Memory Port supports NOR Flash and ROM type external memory and components. To reduce the total system cost and enhance the overall functionality, Exynos 4412 includes many hardware peripherals, such as TFT 24-bit true color LCD controller, Camera Interface, MIPI DSI, CSI-2, System Manager for power management, MIPI slimbus interface, MIPI HSI, four UARTs, 24-channel DMA, Timers, General I/O Ports, three I2S, S/PDIF, eight IIC-BUS interface, three HS-SPI, USB Host 2.0, USB 2.0 Device operating at high speed (480 Mbps), two USB HSIC, four SD Host and high-speed Multimedia Card Interface, Chip to Chip interface, and four PLLs for clock generation. Samsung Exynos User Guide at 1-1

8 Direct Memory Access Controller (DMAC)

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8.1 Overview

The two Direct Memory Access (DMA) tops that Exynos 4412 supports:

- Memory-to-Memory (M2M) transfer (DMA_mem)
- Peripheral-to-memory transfer and vice-versa (DMA_peri)

The DMA_mem consists of one PL330 (DMA) and some logics. DMA_peri consists of two PL330s (DMA0 and DMA1) and dma_map.
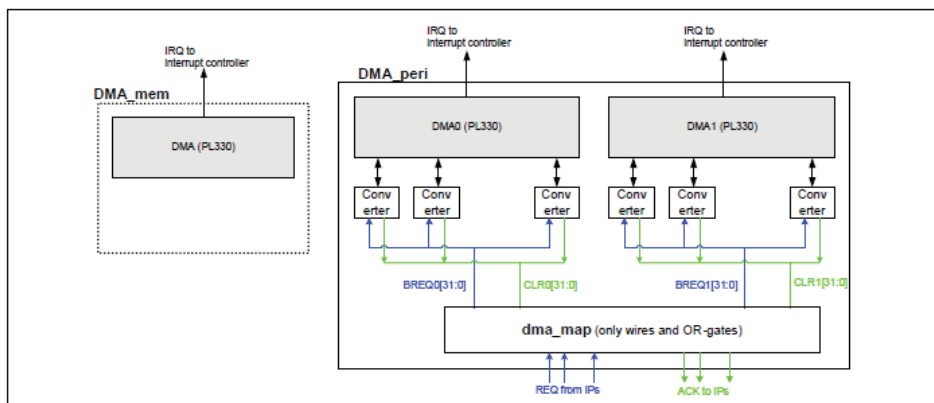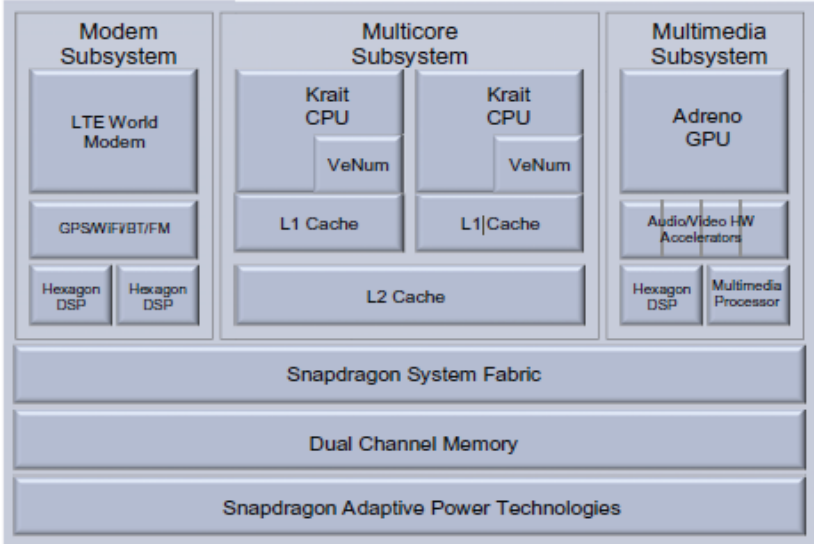
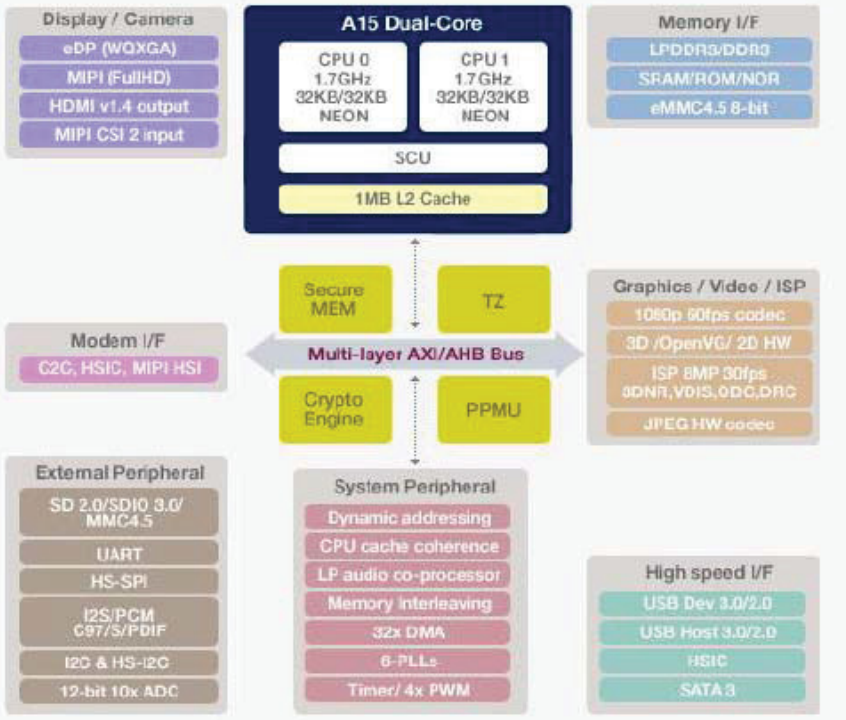Figure 8-1 illustrates the two DMA tops.

Figure 8-1   Two DMA Tops

The attributes that the DMA_mem DMA Controllers have:

Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations

The Claim	Samsung Phones and Tablets[1]
	In regular operation, there is no significant corruption of data due to overwriting or lack of self-regulation. To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Transform Objects automatic flow control of the Source Object, for example that of self-regulating the processing, in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, data and operations executing in the device that are self-regulated.
[31g] providing a sink object, wherein said sink object obtains data stream buffers from said transform object and outputs said streams to a video and audio decoder;	A Samsung device provides a sink object, a collection of data and operations that, among other things, obtains data stream buffers from a transform object and outputs the streams to a video and audio decoder. The Samsung device software obtains data streams from a buffer retrieved from a transform object and the storage devices and outputs the data streams to a video and audio decoder. Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations A Samsung device has a video and audio decoder that converts data streams into display signals and sends those signals to a display. For example, the Snapdragon SoC's contain a decoder coupled to the processor.

The Claim	Samsung Phones and Tablets[1]

The Claim	Samsung Phones and Tablets[1]
	Figure 1: MSM8960 Block Diagram http://www.qualcomm.com/snapdragon/processors/400 (the multimedia block includes a decoder for playback, as does the Adreno GPU and Hexagon DSP) As another example, the Samsung Exynos chips also contain decoders.

The Claim	Samsung Phones and Tablets[1]

Samsung Exynos White paper at 4 (note the codec included in the Graphics/Video/ISP block)

On information and belief, the decoder receives and processes transports streams, and communicates with the onboard processors at least through shared memory.

To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Sink Object, for example that of obtaining buffers and outputting data streams, in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, datastreams being output to a decoder. |
| [31h] wherein | A Samsung device has a decoder that converts data streams into display signals and sends those signals to a display. |

The Claim	Samsung Phones and Tablets[1]
said decoder converts said streams into display signals and sends said signals to a display;	*See, e.g.,*
[31i] wherein said sink object is automatically flow controlled by said transform object;	A Samsung device has a sink object that, among other things, is automatically flow controlled by a transform object. On information and belief, the Samsung device playback software has self-regulated data flow in relation to, for example, the DRAM. *See, e.g.,* (BCM7400 Product Brief) ("The BCM7400 incorporates a complete MIPS32-Verified™ microprocessor subsystem, including caches with bridging to memory and a local bus See also

The Claim	Samsung Phones and Tablets[1]
	# 1 Product Overview ## 1.1 Introduction Exynos 4412 is a 32-bit RISC cost-effective, low power, performance optimized and Coretex-A9 Quad Core based micro-processor solution for smart phone applications. The memory system has dedicated DRAM ports and Static Memory port. The dedicated DRAM ports support LPDDR2 interface for high bandwidth. Static Memory Port supports NOR Flash and ROM type external memory and components. To reduce the total system cost and enhance the overall functionality, Exynos 4412 includes many hardware peripherals, such as TFT 24-bit true color LCD controller, Camera Interface, MIPI DSI, CSI-2, System Manager for power management, MIPI slimbus interface, MIPI HSI, four UARTs, 24-channel DMA, Timers, General I/O Ports, three I2S, S/PDIF, eight IIC-BUS interface, three HS-SPI, USB Host 2.0, USB 2.0 Device operating at high speed (480 Mbps), two USB HSIC, four SD Host and high-speed Multimedia Card Interface, Chip to Chip interface, and four PLLs for clock generation. Samsung Exynos User Guide at 1-1

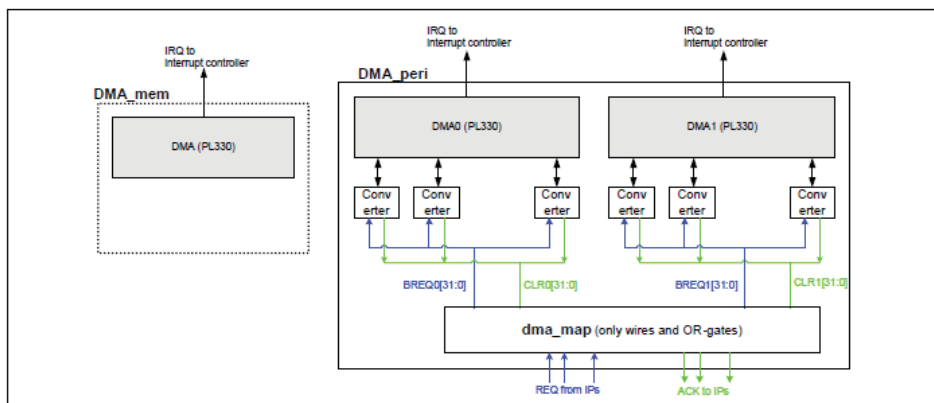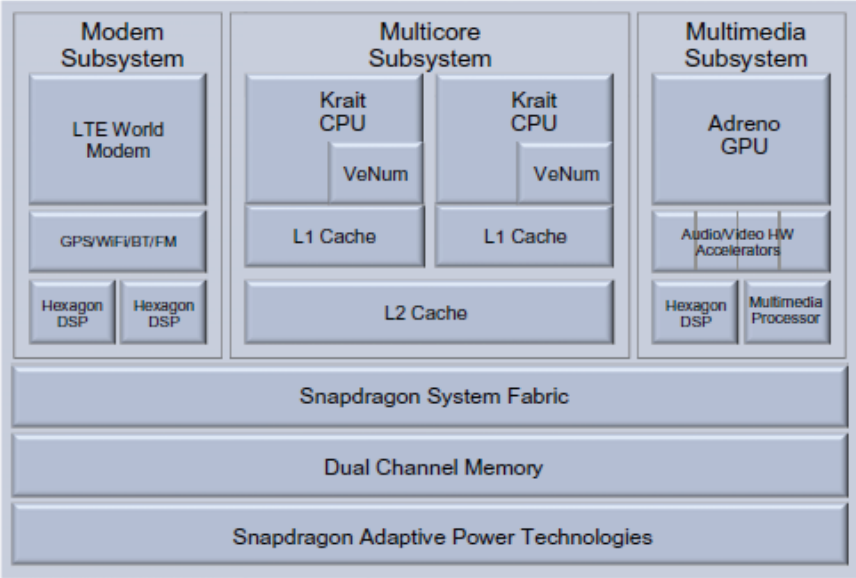| The Claim	Samsung Phones and Tablets[1]
	# 8 Direct Memory Access Controller (DMAC) This chapter includes: • Overview of DMA Controller • Register description • Instruction ## 8.1 Overview The two Direct Memory Access (DMA) tops that Exynos 4412 supports: • Memory-to-Memory (M2M) transfer (DMA_mem) • Peripheral-to-memory transfer and vice-versa (DMA_peri) The DMA_mem consists of one PL330 (DMA) and some logics. DMA_peri consists of two PL330s (DMA0 and DMA1) and dma_map. *Figure 8-1* illustrates the two DMA tops. Figure 8-1 Two DMA Tops The attributes that the DMA_mem DMA Controllers have: Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations

| The Claim	Samsung Phones and Tablets[1]
	In regular operation, there is no significant corruption of data due to overwriting or lack of self-regulation. To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Transform Object's automatic flow control of the Sink Object, for example that of self-regulating the processing, in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, data and operations executing in the device that are self-regulated.
[31j] providing a control object, wherein said control object receives commands from a user, said commands control the flow of the broadcast data through the system; and	A Samsung device provides a control object, a collection of data and operations that, among other things, receives user commands, which control the flow of the broadcast data through the system. The Samsung device software is responsive to a capacitive touchscreen over the display, which is responsive to user input and which can control the flow of broadcast data, for example by selecting certain play-back modes. Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Control Object, for example that of receiving commands same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, controlling the flow of the broadcast data through the system.
[31k] wherein said control object sends flow command events to said source, transform, and sink objects.	Samsung device provides a control object, a collection of data and operations that, among other things, receives user commands, which control the flow of the broadcast data through the system. The Samsung device software is responsive to a capacitive touchscreen over the display, which is responsive to user input and which can control the flow of broadcast data, for example by selecting certain play-back modes. Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform

The Claim	Samsung Phones and Tablets[1]
	substantially the same function as the Control Object, for example that of sending flow commands to the other device processes, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, controlling the flow of the broadcast data through the system.
Claim 61	
61[a]. An apparatus for the simultaneous storage and play back of multimedia data, comprising:	A Samsung device can simultaneously store and play back multimedia data._See, e.g.,_In one aspect, the Device can store video while simultaneously playing back a previously stored video file.In another aspect, the Device can store a video file transferred from a PC, while at the same time playing back that same file while it is being stored to the storage deviceIn another aspect the Device can store a video file while at the same time playing back that same file
[61b] a physical data source, wherein said physical data source accepts broadcast data from an input device, parses video and audio data from said broadcast data, and temporarily stores said video and audio data;	A Samsung device has an input device that may include a USB port, a mobile communication device, and/or, on information and belief, other components such a Qualcomm Snapdragon or Samsung Exynos System on Chip, or other similar chip that may perform parsing and or storage, including chips made by other third parties._See, e.g.,_

The Claim	Samsung Phones and Tablets[1]

	enhancements. *See, .e.g.,*
	
	- • Video processor: The video processor supports:
	   – BOB/2D-IPC mode
	   – Production of YCbCr 4: 4: 4 output to help the mixer blend video and graphics
	   – 1/4X to 16X vertical scaling with 4-tap/16-phase polyphase filter
	   – 1/4X to 16X horizontal scaling with 8-tap/16-phase polyphase filter
	   – Pan and scan, Letterbox, and NTSC/PAL conversion using scaling
	   – Flexible scaled video positioning within display area
	   – 1/16 pixel resolution Pan and Scan modes
	   – Flexible post video processing
	      ○ Color saturation, brightness/contrast enhancement, edge enhancement
	      ○ Color space conversion between BT.601 and BT.709
	   – Video input source size up to 1920 × 1080
	- • Video Mixer
	  The Video Mixer supports:
	   – Overlapping and blending input video and graphic layers
	   – 480p, 576p, 720p, and 1080i/p display size
	   – Four layers (1 video layer, 2 graphic layer, and 1 background layer)
	
	Exynos Quad 4 user manual, at 1-7
	
	To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the physical data source, for example that accepting, parsing, and temporarily storing, in substantially the same way, for example by receiving data that has been transmitted to the device, PID filtering, startcode detecting and otherwise analyzing that data, and writing that data to memory locations and disks, to yield the same result, a properly formatted data stream for further processing by the rest of the system.

[61c] a source object, wherein	A Samsung device provides a source object, a collection of data and operations that, among other things, extracts video and audio data from the physical data source.

The Claim	Samsung Phones and Tablets[1]
said source object extracts video and audio data from said physical data source;	Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claims collection of data and operations.

For example, in a Samsung device, video and audio data move from the Snapdragon chip, Exynos chip, or similar chip, to memory, including DRAM and/or the other subprocessors.

The Snapdragon chips contains a "multimedia subsystem."

Figure 1: MSM8960 Block Diagram

Snapdragon S4 Whitepaper, at page 2.

The Samsung Exynos Chips contain a multimedia subsystem (also called a DMC), which extracts video and audio data from the

The Claim	Samsung Phones and Tablets[1]

	physical data source
	
	1.2.3 Multimedia
	
	The features of multimedia are:
	
	• Camera Interface
	  – Multiple input support
	    ○ ITU-R BT 601/656 mode
	    ○ DMA (AXI 64-bit interface) mode
	    ○ MIPI (CSI) mode
	    ○ Direct FIFO mode (from LCDC)
	  – Multiple output support
	    ○ DMA (AXI 64-bit interface) mode
	    ○ Direct FIFO mode (to LCDC)
	  – Digital Zoom In (DZI) capability
	  – Multiple camera input support
	  – Programmable polarity of video sync signals
	  – Input horizontal size support up to 4224 pixels for scaled and 8192 pixels for un-scaled resolution
	  – Image mirror and rotation (X-axis mirror, Y-axis mirror, 90°, 180°, and 270° rotation)
	  – Various image formats generation
	  – Capture frame control support
	  – Image effect support
	• JPEG Codec supports:
	  – Compression/Decompression up to 65536×65536
	  – Supported format of compression
	    ○ Input raw image: YCbCr4:2:2 or RGB 565
	    ○ Output JPEG file: Baseline JPEG of YCbCr4:2:2 or YCbCr4:2:0
	  – General-purpose color-space converter
	• 2D Graphic Engine supports:
	  – BitBLT
	  – Maximum 8000×8000 image size
	  – Window clipping, 90°/180°/270°/Rotation, X Flip/Y Flip
	  – Totally 4-operand raster operation (ROP4)
	  – Alpha blending (user-specified constant alpha value/per-pixel alpha value)
	  – 8/16/24/32-bpp. Packed 24-bpp color format, Premultiplied/Non-premultiplied alpha format
	  – 1 bpp/4 bpp/8 bpp/16 bpp/32 bpp Mask format, YCbCr format

The Claim	Samsung Phones and Tablets[1]

	- Digital TV Interface supports:
	  – High-Definition Multimedia Interface (HDMI) 1.4 a
	  – Up to 1080 p 60 Hz and 8-channel/112 kHz/24-bit audio
	  – 480 p, 576 p, 720 p, 1080i (cannot support 480i)
	  – HDCP V1.1
	  – 3D support
	- Rotator
	  – Supported image format: YCbCr422 (Interleave), YCbCr420 (Non-interleave), and RGB565 and RGB8 (unpacked)
	  – Supported rotate degree: 90, 180, 270, flip vertical, and flip horizontal
	- Video processor: The video processor supports:
	  – BOB/2D-IPC mode
	  – Production of YCbCr 4: 4: 4 output to help the mixer blend video and graphics
	  – 1/4X to 16X vertical scaling with 4-tap/16-phase polyphase filter
	  – 1/4X to 16X horizontal scaling with 8-tap/16-phase polyphase filter
	  – Pan and scan, Letterbox, and NTSC/PAL conversion using scaling
	  – Flexible scaled video positioning within display area
	  – 1/16 pixel resolution Pan and Scan modes
	  – Flexible post video processing
	    ○ Color saturation, brightness/contrast enhancement, edge enhancement
	    ○ Color space conversion between BT.601 and BT.709
	  – Video input source size up to 1920 × 1080
	- Video Mixer
	  The Video Mixer supports:
	  – Overlapping and blending input video and graphic layers
	  – 480p, 576p, 720p, and 1080i/p display size
	  – Four layers (1 video layer, 2 graphic layer, and 1 background layer)
	- TFT-LCD Interface
	  The TFT-LCD Interface supports:
	  – 24/18/16-bpp parallel RGB Interface LCD
	  – 8/6 bpp serial RGB Interface
	  – Dual i80 Interface LCD
	  – 1/2/4/8 bpp Palletized or 8/16/24-bpp Non-Palletized Color TFT
	  – Typical actual screen size: 1080 × 1024,1024 × 768, 800 × 480, 640 × 480, 320 × 240, 160 × 160, and so on
	  – Virtual image up to 16M pixel (4K pixel × 4K pixel)
	  – Five Window Layers for PIP or OSD
	  – Real-time overlay plane multiplexing
	  – Programmable OSD window positioning
	  – 16-level alpha blending
	
	Samsung Exynos User Guide at 1-7 -- 1-8
	
	To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung Mobile Devices perform substantially the same function as the Source Object, for example that of extracting video and audio data from said physical data source, in substantially the same way, for example by using one or more instantiations of software codes and/or

The Claim	Samsung Phones and Tablets[1]
	hardware/firmware combinations, to yield the same result, data and operations executing in the Device that operate on the video and audio data from the physical data source.
[61d] a transform object, wherein said transform object stores and retrieves data streams onto a storage device;	A Samsung device provides a transform object, a collection of data and operations that, among other things, transforms the form of data upon which it operates. For example, Samsung devices transform the form of the data. Upon information and belief, the Samsung devices store multimedia program data during recording, and play back certain portions, such as certain frames, during certain trickplay operations.

Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations.

As another example, Samsung devices also perform a temporal transform. For example, Samsung devices allow users to store programs to watch at a later time, and simultaneously with the program being stored on the device.

A Samsung Mobile Device has a storage device. For example, a Samsung Mobile Device includes a solid state memory, e.g. flash memory used for storage. And the Samsung devices contain a collection of data and operations that store the multimedia data on the storage device. Additionally, a Samsung device includes many memory locations, including solid state disks, ram, cache memory, and other locations.

On information and belief, many of the devices has at least 16 GB of internal storage, which takes the form of flash memory.

On information and belief, Samsung Mobile Devices store MPEG transport stream packets on a solid state disk (SSD) during recording. These data could come from MPEG files transferred to the device from a PC, or from a wireless communications network, among others.

To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Transform Object, for example that of storing and retrieving data streams onto a storage device, in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, data and operations executing in the device that move video and audio data to and from storage locations. |
| [61e] wherein said source object obtains a buffer | A Samsung device provides a source object, a collection of data and operations that, among other things, obtains a buffer from the transform object, converts video data into data streams, and fills the buffer with the streams. Samsung device software obtains a buffer, converts video data into data streams and fills the buffer with the streams. Samsung devices contain DMA |

The Claim	Samsung Phones and Tablets[1]
from said transform object, said source object converts video data into data streams and fills said buffer with said streams;	controllers and other hardware and software that effectively utilizes buffers and memory to perform the claimed operations. On information and belief the media switch in the chips will write to various memory locations using direct memory access (DMA) transfers, and this action is controlled by a DMA controller. See also **1 Product Overview** **1.1 Introduction** Exynos 4412 is a 32-bit RISC cost-effective, low power, performance optimized and Coretex-A9 Quad Core based micro-processor solution for smart phone applications. The memory system has dedicated DRAM ports and Static Memory port. The dedicated DRAM ports support LPDDR2 interface for high bandwidth. Static Memory Port supports NOR Flash and ROM type external memory and components. To reduce the total system cost and enhance the overall functionality, Exynos 4412 includes many hardware peripherals, such as TFT 24-bit true color LCD controller, Camera Interface, MIPI DSI, CSI-2, System Manager for power management, MIPI slimbus interface, MIPI HSI, four UARTs, 24-channel DMA, Timers, General I/O Ports, three I2S, S/PDIF, eight IIC-BUS interface, three HS-SPI, USB Host 2.0, USB 2.0 Device operating at high speed (480 Mbps), two USB HSIC, four SD Host and high-speed Multimedia Card Interface, Chip to Chip interface, and four PLLs for clock generation. Samsung Exynos User Guide at 1-1

8 Direct Memory Access Controller (DMAC)

This chapter includes:

- Overview of DMA Controller
- Register description
- Instruction

8.1 Overview

The two Direct Memory Access (DMA) tops that Exynos 4412 supports:

- Memory-to-Memory (M2M) transfer (DMA_mem)
- Peripheral-to-memory transfer and vice-versa (DMA_peri)

The DMA_mem consists of one PL330 (DMA) and some logics. DMA_peri consists of two PL330s (DMA0 and DMA1) and dma_map.
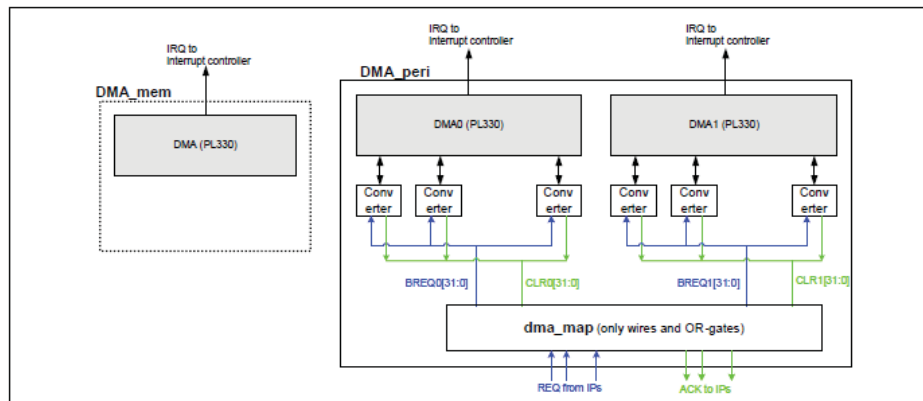
Figure 8-1 illustrates the two DMA tops.

Figure 8-1   Two DMA Tops

The attributes that the DMA_mem DMA Controllers have:

Samsung Exynos User Guide at 8-1

The Claim	Samsung Phones and Tablets[1]
	Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Source Object, for example that of obtaining a memory location, converting the data stream, and filling the memory location in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, data and operations executing in the device that operate on the video and audio data in conjunction with memory locations and other software processes.
[61f] wherein said source object is automatically flow controlled by said transform object;	A Samsung device has a source object that, among other things, is automatically flow controlled by a transform object. On information and belief, the Samsung device software has self-regulating data flow in relation to, for example, the single-port DRAM. See also

The Claim	Samsung Phones and Tablets[1]
	# 1 Product Overview ## 1.1 Introduction Exynos 4412 is a 32-bit RISC cost-effective, low power, performance optimized and Coretex-A9 Quad Core based micro-processor solution for smart phone applications. The memory system has dedicated DRAM ports and Static Memory port. The dedicated DRAM ports support LPDDR2 interface for high bandwidth. Static Memory Port supports NOR Flash and ROM type external memory and components. To reduce the total system cost and enhance the overall functionality, Exynos 4412 includes many hardware peripherals, such as TFT 24-bit true color LCD controller, Camera Interface, MIPI DSI, CSI-2, System Manager for power management, MIPI slimbus interface, MIPI HSI, four UARTs, 24-channel DMA, Timers, General I/O Ports, three I2S, S/PDIF, eight IIC-BUS interface, three HS-SPI, USB Host 2.0, USB 2.0 Device operating at high speed (480 Mbps), two USB HSIC, four SD Host and high-speed Multimedia Card Interface, Chip to Chip interface, and four PLLs for clock generation. Samsung Exynos User Guide at 1-1

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8.1 Overview

The two Direct Memory Access (DMA) tops that Exynos 4412 supports:

- Memory-to-Memory (M2M) transfer (DMA_mem)
- Peripheral-to-memory transfer and vice-versa (DMA_peri)

The DMA_mem consists of one PL330 (DMA) and some logics. DMA_peri consists of two PL330s (DMA0 and DMA1) and dma_map.
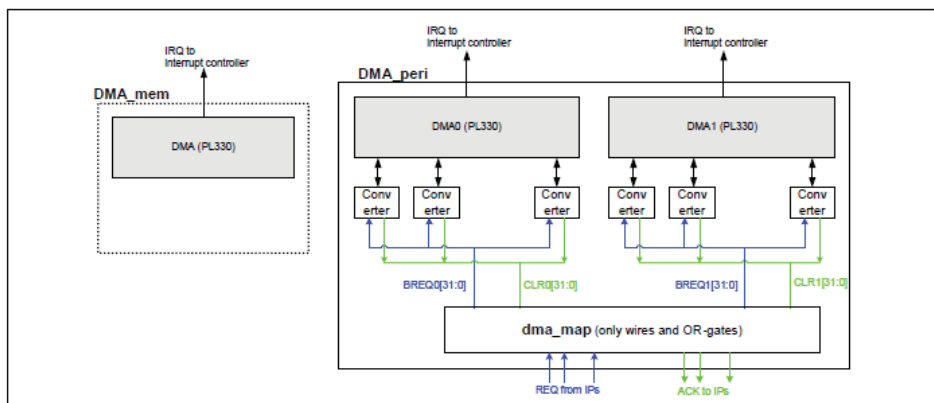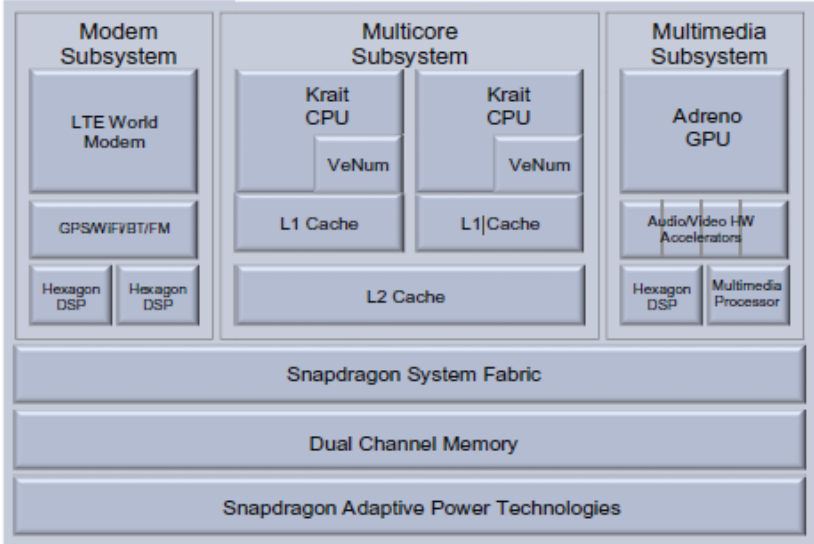
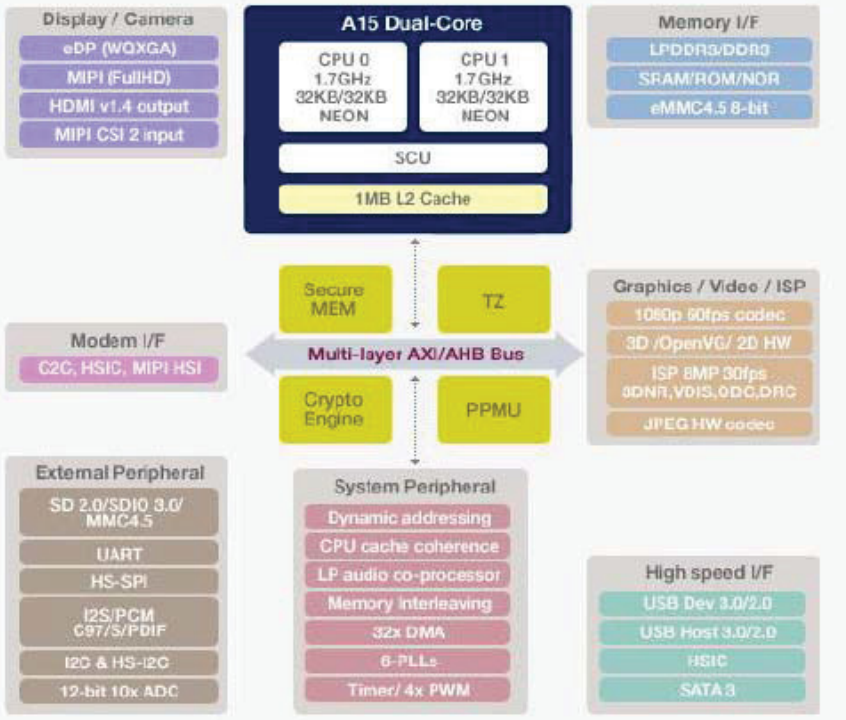*Figure 8-1* illustrates the two DMA tops.

Figure 8-1   Two DMA Tops

The attributes that the DMA_mem DMA Controllers have:

Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations

The Claim	Samsung Phones and Tablets[1]
	In regular operation, there is no significant corruption of data due to overwriting or lack of self-regulation.

To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Transform Objects automatic flow control of the Source Object, for example that of self-regulating the processing, in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, data and operations executing in the device that are self-regulated. |
| [61g] a sink object, wherein said sink object obtains data stream buffers from said transform object and outputs said streams to a video and audio decoder; | A Samsung device provides a sink object, a collection of data and operations that, among other things, obtains data stream buffers from a transform object and outputs the streams to a video and audio decoder. The Samsung device software obtains data streams from a buffer retrieved from a transform object and the storage devices and outputs the data streams to a video and audio decoder.

Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations

A Samsung device has a video and audio decoder that converts data streams into display signals and sends those signals to a display.

For example, the Snapdragon SoC's contain a decoder coupled to the processor. |

The Claim	Samsung Phones and Tablets[1]
	Figure 1: MSM8960 Block Diagram http://www.qualcomm.com/snapdragon/processors/400 (the multimedia block includes a decoder for playback, as does the Adreno GPU and Hexagon DSP) As another example, the Samsung Exynos chips also contain decoders.

The Claim	Samsung Phones and Tablets[1]

Samsung Exynos White paper at 4 (note the codec included in the Graphics/Video/ISP block)

On information and belief, the decoder receives and processes transports streams, and communicates with the onboard processors at least through shared memory.

To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Sink Object, for example that of obtaining buffers and outputting data streams, in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, datastreams being output to a decoder. |
| [61h] wherein | A Samsung device has a decoder that converts data streams into display signals and sends those signals to a display. |

The Claim	Samsung Phones and Tablets[1]
said decoder converts said streams into display signals and sends said signals to a display;	*See, e.g.,*
[61i] wherein said sink object is automatically flow controlled by said transform object;	A Samsung device has a sink object that, among other things, is automatically flow controlled by a transform object. On information and belief, the Samsung device playback software has self-regulated data flow in relation to, for example, the DRAM. *See, e.g.,* (BCM7400 Product Brief) ("The BCM7400 incorporates a complete MIPS32-Verified™ microprocessor subsystem, including caches with bridging to memory and a local bus See also

The Claim	Samsung Phones and Tablets[1]
	# 1 Product Overview ## 1.1 Introduction Exynos 4412 is a 32-bit RISC cost-effective, low power, performance optimized and Coretex-A9 Quad Core based micro-processor solution for smart phone applications. The memory system has dedicated DRAM ports and Static Memory port. The dedicated DRAM ports support LPDDR2 interface for high bandwidth. Static Memory Port supports NOR Flash and ROM type external memory and components. To reduce the total system cost and enhance the overall functionality, Exynos 4412 includes many hardware peripherals, such as TFT 24-bit true color LCD controller, Camera Interface, MIPI DSI, CSI-2, System Manager for power management, MIPI slimbus interface, MIPI HSI, four UARTs, 24-channel DMA, Timers, General I/O Ports, three I2S, S/PDIF, eight IIC-BUS interface, three HS-SPI, USB Host 2.0, USB 2.0 Device operating at high speed (480 Mbps), two USB HSIC, four SD Host and high-speed Multimedia Card Interface, Chip to Chip interface, and four PLLs for clock generation. Samsung Exynos User Guide at 1-1

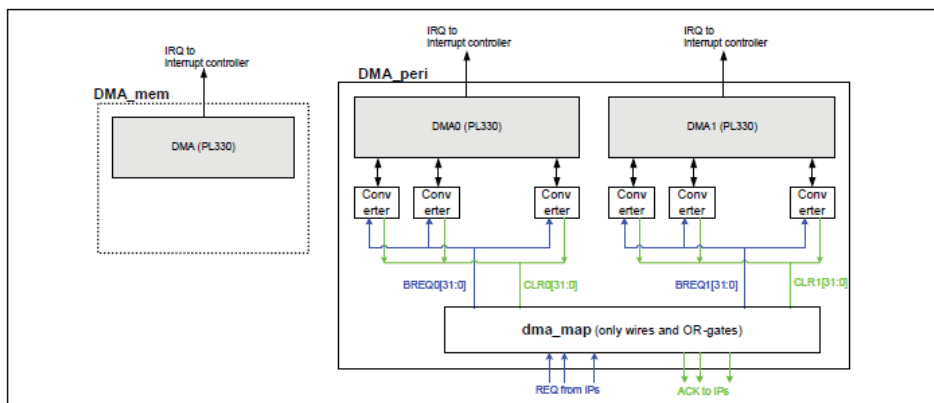| The Claim	Samsung Phones and Tablets[1]
	# 8 Direct Memory Access Controller (DMAC) This chapter includes: - Overview of DMA Controller - Register description - Instruction ## 8.1 Overview The two Direct Memory Access (DMA) tops that Exynos 4412 supports: - Memory-to-Memory (M2M) transfer (DMA_mem) - Peripheral-to-memory transfer and vice-versa (DMA_peri) The DMA_mem consists of one PL330 (DMA) and some logics. DMA_peri consists of two PL330s (DMA0 and DMA1) and dma_map. Figure 8-1 illustrates the two DMA tops. **Figure 8-1 Two DMA Tops** The attributes that the DMA_mem DMA Controllers have:

Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations

The Claim	Samsung Phones and Tablets[1]
	In regular operation, there is no significant corruption of data due to overwriting or lack of self-regulation.

To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Transform Object's automatic flow control of the Sink Object, for example that of self-regulating the processing, in substantially the same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, data and operations executing in the device that are self-regulated. |
| [61j] a control object, wherein said control object receives commands from a user, said commands control the flow of the broadcast data through the system; and | A Samsung device provides a control object, a collection of data and operations that, among other things, receives user commands, which control the flow of the broadcast data through the system. The Samsung device software is responsive to a capacitive touchscreen over the display, which is responsive to user input and which can control the flow of broadcast data, for example by selecting certain play-back modes.

Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations

To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform substantially the same function as the Control Object, for example that of receiving commands same way, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, controlling the flow of the broadcast data through the system. |
| [61k] wherein said control object sends flow command events to said source, transform, and sink objects. | Samsung device provides a control object, a collection of data and operations that, among other things, receives user commands, which control the flow of the broadcast data through the system. The Samsung device software is responsive to a capacitive touchscreen over the display, which is responsive to user input and which can control the flow of broadcast data, for example by selecting certain play-back modes.

Without seeing the source code for the device itself, which is not publicly available, on information and belief, based on operation and description of operation of the device, Samsung devices include the claimed collection of data and operations

To the extent any differences are alleged to exist between this claim element and the above referenced functionality, such differences are insubstantial. On information and belief, the hardware and software in the Samsung mobile devices perform |

The Claim	Samsung Phones and Tablets[1]
	substantially the same function as the Control Object, for example that of sending flow commands to the other device processes, for example by using one or more instantiations of software codes and/or hardware/firmware combinations, to yield the same result, controlling the flow of the broadcast data through the system.